We have defined several quantifiers by starting with an associative symmetric operator with an identity. Bunch union is also such an operator. Does it yield a quantifier?

After trying the question, scroll down to the solution.
§ Yes. I'll use $\mathcal{U}$ for the quantifier.

\[
\begin{align*}
\mathcal{U}v: \text{null} \cdot e &= \text{null} \\
\mathcal{U}v: x \cdot e &= \langle v: x \cdot e \rangle x \quad \text{for element } x \\
\mathcal{U}v: A, B \cdot e &= (\mathcal{U}v: A \cdot e), (\mathcal{U}v: B \cdot e) \\
\mathcal{U}v: (\$v: D \cdot b) \cdot c &= \mathcal{U}v: D \cdot \text{if } b \text{ then } c \text{ else } \text{null fi}
\end{align*}
\]

Application of function $f$ distributes over bunch union, so the $\mathcal{U}$ quantifier gives the range of a function.

$\mathcal{U}f = f (\square f)$